

WHAT IS CLAIMED IS:

- 1           1.     A spin valve transistor, comprising:  
2           a collector comprising a III-IV semiconductor;  
3           a first spin valve comprising (100)-oriented metals deposited over the collector;  
4           a spacer disposed over the first spin valve;  
5           a second spin valve comprising (100)-oriented metals deposited over the spacer;  
6           a tunnel barrier layer disposed over the second spin valve; and  
7           an emitter disposed over the tunnel barrier layer.
- 1           2.     The spin valve transistor of claim 1, wherein the first and second spin  
2     valves each comprise a pinned layer, the pinned layers being pinned 180° out of phase to  
3     provide differential detection.
- 1           3.     The spin valve transistor of claim 1, wherein the first and second spin  
2     valves comprises a first magnetic layer, a non-magnetic layer disposed over the first  
3     magnetic layer and a second magnetic layer disposed over the non-magnetic layer.
- 1           4.     The spin valve transistor of claim 3, wherein the first and second magnetic  
2     layers comprise an iron film.
- 1           5.     The spin valve transistor of claim 4, wherein the non-magnetic layer  
2     comprises a gold film.

1           6.       The spin valve transistor of claim 3, wherein the non-magnetic layer  
2 comprises a gold film.

1           7.       The spin valve transistor of claim 1, wherein the collector comprises an n-  
2 GaAs substrate.

1           8.       The spin valve transistor of claim 1, wherein the spacer comprises a  
2 (100)—oriented layer of gold.

1           9.       The spin valve transistor of claim 1, wherein the tunnel barrier layer  
2 comprises a layer of  $\text{Al}_2\text{O}_3$ .

1           10.      The spin valve transistor of claim 1, wherein the emitter comprises a layer  
2 of aluminum disposed over the tunnel barrier layer and a layer of gold disposed over the  
3 aluminum.

1           11.     A magnetic storage device, comprising:  
2           at least one magnetic storage medium;  
3           a motor for moving the at least one magnetic storage medium;  
4           a magnetoresistive sensor for reading data on the at least one magnetic storage  
5 medium, and  
6           an actuator assembly, coupled to the ballistic magnetoresistive sensor, for moving  
7 the ballistic magnetoresistive sensor relative to the at least one magnetic storage medium;  
8           wherein the magnetoresistive sensor further comprising a spin valve transistor, the  
9 spin valve transistor including:  
10                  a collector comprising a III-IV semiconductor;  
11                  a first spin valve comprising (100)-oriented metals deposited over the  
12 collector;  
13                  a spacer disposed over the first spin valve;  
14                  a second spin valve comprising (100)-oriented metals deposited over the  
15 spacer;  
16                  a tunnel barrier layer disposed over the second spin valve; and  
17                  an emitter disposed over the tunnel barrier layer.

1           12.     The magnetic storage device of claim 11, wherein the first and second spin  
2 valves each comprise a pinned layer, the pinned layers being pinned 180° out of phase to  
3 provide differential detection.

1           13.    The magnetic storage device of claim 11, wherein the first and second spin  
2 valves comprises a first magnetic layer, a non-magnetic layer disposed over the first  
3 magnetic layer and a second magnetic layer disposed over the non-magnetic layer.

1           14.    The magnetic storage device of claim 13, wherein the first and second  
2 magnetic layers comprise an iron film.

1           15.    The magnetic storage device of claim 14, wherein the non-magnetic layer  
2 comprises a gold film.

1           16.    The magnetic storage device of claim 13, wherein the non-magnetic layer  
2 comprises a gold film.

1           17.    The magnetic storage device of claim 11, wherein the collector comprises  
2 an n-GaAs substrate.

1           18.    The magnetic storage device of claim 11, wherein the spacer comprises a  
2 (100)—oriented layer of gold.

1           19.    The magnetic storage device of claim 11, wherein the tunnel barrier layer  
2 comprises a layer of  $\text{Al}_2\text{O}_3$ .

1           20.     The magnetic storage device of claim 11, wherein the emitter comprises a  
2 layer of aluminum disposed over the tunnel barrier layer and a layer of gold disposed  
3 over the aluminum.

1           21.     A method for forming a spin valve transistor, comprising:  
2           forming a collector comprising a III-IV semiconductor;  
3           forming a first spin valve comprising (100)-oriented metals deposited over the  
4 collector;  
5           forming a spacer over the first spin valve;  
6           forming a second spin valve comprising (100)-oriented metals over the spacer;  
7           forming a tunnel barrier layer over the second spin valve; and  
8           forming an emitter over the tunnel barrier layer.

1           22.     The spin valve transistor of claim 21, wherein the forming the first and  
2 second spin valves further comprises forming a pinned layer pinned 180° out of phase in  
3 each of the first and second spin valves to provide differential detection.

1           23.     The spin valve transistor of claim 21, wherein the forming the first and  
2 second spin valves further comprises forming a first magnetic layer, forming a non-  
3 magnetic layer over the first magnetic layer and forming a second magnetic layer  
4 disposed over the non-magnetic layer.

1           24.     The spin valve transistor of claim 23, wherein the forming the first and  
2     second magnetic layers further comprises forming a first and second iron film.

1           25.     The spin valve transistor of claim 24, wherein the forming the non-  
2     magnetic layer further comprises forming a gold film.

1           26.     The spin valve transistor of claim 23, wherein the forming the non-  
2     magnetic layer further comprises forming a gold film.

1           27.     The spin valve transistor of claim 21, wherein the forming the collector  
2     further comprises forming an n-GaAs substrate.

1           28.     The spin valve transistor of claim 21, wherein the forming the spacer  
2     further comprises forming a (100)—oriented layer of gold.

1           29.     The spin valve transistor of claim 21, wherein the forming the tunnel  
2     barrier layer further comprises forming a layer of  $\text{Al}_2\text{O}_3$ .

1           30.     The spin valve transistor of claim 21, wherein the forming the emitter  
2     further comprises forming a layer of aluminum over the tunnel barrier layer and forming  
3     a layer of gold over the aluminum.

1           31.    A spin valve transistor, comprising:  
2                means for providing a collector comprising a III-IV semiconductor;  
3                means for providing a first spin valve comprising (100)-oriented metals deposited  
4 over the means for providing a collector;  
5                means for providing a spacer disposed over the means for providing a first spin  
6 valve;  
7                means for providing a second spin valve comprising (100)-oriented metals deposited  
8 over the means for providing a spacer;  
9                means for providing a tunnel barrier layer disposed over the means for providing a  
10 second spin valve; and  
11               means for providing an emitter disposed over the means for providing a tunnel  
12 barrier layer.

1           32.    A magnetic storage device, comprising:  
2           means for recording magnetic data thereon;  
3           means for moving the means for recording magnetic data;  
4           means for reading data on the means for recording magnetic data; and  
5           means, coupled to the means for reading, for moving the means for reading  
6 relative to the means for storing data, wherein the means for reading further comprising:  
7                   means for providing a collector comprising a III-IV semiconductor;  
8                   means for providing a first spin valve comprising (100)-oriented metals  
9 deposited over the means for providing a collector;  
10                   means for providing a spacer disposed over the means for providing a first  
11 spin valve;  
12                   means for providing a second spin valve comprising (100)-oriented metals  
13 deposited over the means for providing a spacer;  
14                   means for providing a tunnel barrier layer disposed over the means for  
15 providing a second spin valve; and  
16                   means for providing an emitter disposed over the means for providing a  
17 tunnel barrier layer.